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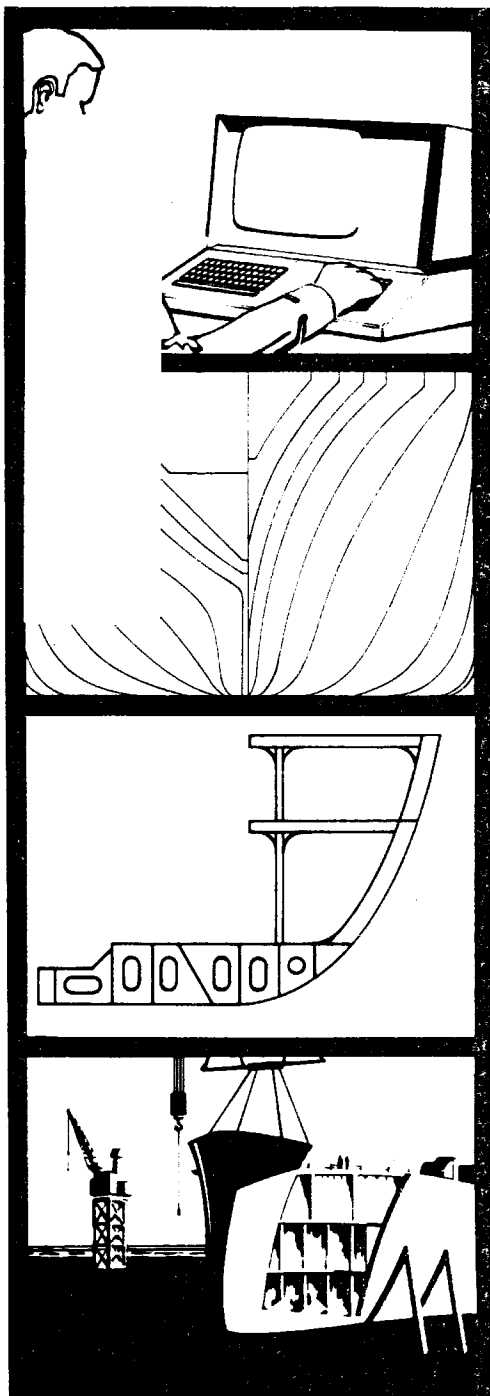
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THE INGALLS PRODUCTION PLANNING AND CONTROL SYSTEM

James F. Davidson
Ingalls Shipbuilding Division
Pascagoula, Mississippi

Mr. Davidson is Manager of the Business Applications group at Ingalls Shipbuilding. He is responsible for the planning, design, development, programming, implementation and administration of all non-technical data processing methods and systems to support the production and management effort at Ingalls.

In the past, he has worked for Computer Sciences Corporation, Boeing, and divisions of Litton Industries. Dr. Davidson was also a partner in a small software firm which designed and marketed software for minicomputer applications.

INGALLS PRODUCTION PLANNING AND CONTROL SYSTEM OUTLINE

I . SYSTEM OVERVIEW

- A. DEFINITION OF TERMS
- B. MODULE FUNCTIONS
- c. MODULE INTERFACES

II. CONSOLIDATED DATA BASE MODULE

- A. FUNCTION
- B. DESCRIPTION
- C. DATA BASE STRUCTURE
- D. INTERFACES

III. BUDGET ALLOCATION MODULE

- A. FUNCTION
- B. DESCRIPTION
- C. INTERFACES

IV. LABOR PROGRESSING MODULE

- A. FUNCTION
- B. DESCRIPTION
- C. INTERFACES

v. LABOR MANNING MODULE

- A. FUNCTION
- B. DESCRIPTION
- C. INTERFACES

VI. LABOR RESCHEULING MODULE

- A. FUNCTION
- B. DESCRIPTION
- c. INTERFACES

VII. LABOR REPORTING MODULES

- A. PLANNING AND SCHEDULING
- B. CONTRACT PERFORMANCE
- C. BUDGET PERFORMANCE
- D. REAL-TIME

I. SYSTEM OVERVIEW

Ingalls' Production Planning and Control System assists in planning, scheduling, budgeting and tracking each work authorization developed to support the construction of each ship. The system is comprised of modules that have specific functions within the System and some of the modules interface with other modules. To assist in understanding the Ingalls' Production Planning and Control System, a definition of terms to be used, a brief description of each module's function, and a diagram of the module interfaces follow:

A. DEFINITION OF TERMS

For purposes of this presentation, the following definitions are offered:

USER- one who inputs data to or receives data from the System.

HULL- ship.

WORK AUTHORIZATION - a logical package of related work for one part of a ship.

WORK STATION- a geographical area within the shipyard.

COST CENTER- a budget and cost collection center.

OPERATION - a craft or type of work.

CRAFT -a particular trade, such as Welder, Shipfitter, Carpenter, etc.

STANDARD BUDGET -engineered number of hours required to perform a particular type of work under ideal conditions.

COMPANY OPERATING BUDGET - standard. budget factored by performance.

CONTRACT BUDGET - baseline established based on negotiated contract values.

B. MODULE FUNCTIONS

Each module in Ingalls' Production Planning and Control System has a specific function. The basic function of each module is as follows:

1. Consolidated Data base (CDB) Module

This module is the nucleus of the system and its function is to maintain the schedules, budgets and actuals for all work authorizations used by the Company.

2. Budget Allocation Module

The function of this module is to programmatically distribute a Company Operating Budget and a Contract Budget to each work authorization contained in the CDB Module.

3 Labor Progressing Module

The primary function of this module is to programmatically compute labor progress to budget for each work authorization in the CDB Module.

4. Labor Manning Module

This modules fuunction is to programatically time-phase work authorization budgets over work authorization schedules to reflect the time-phased labor manning required to construct each ship.

5. Labor Rescheduling Module

This module contains high-level PERT network activities of each ship and a cross-reference to all work authorizations

for each network activity. This module is used to reschedule work authorizations in the CDB Module whenever the schedule for a network activity changes.

6. Labor Reporting Modules

There are four distinct reporting modules within the Production Planning and Control System:

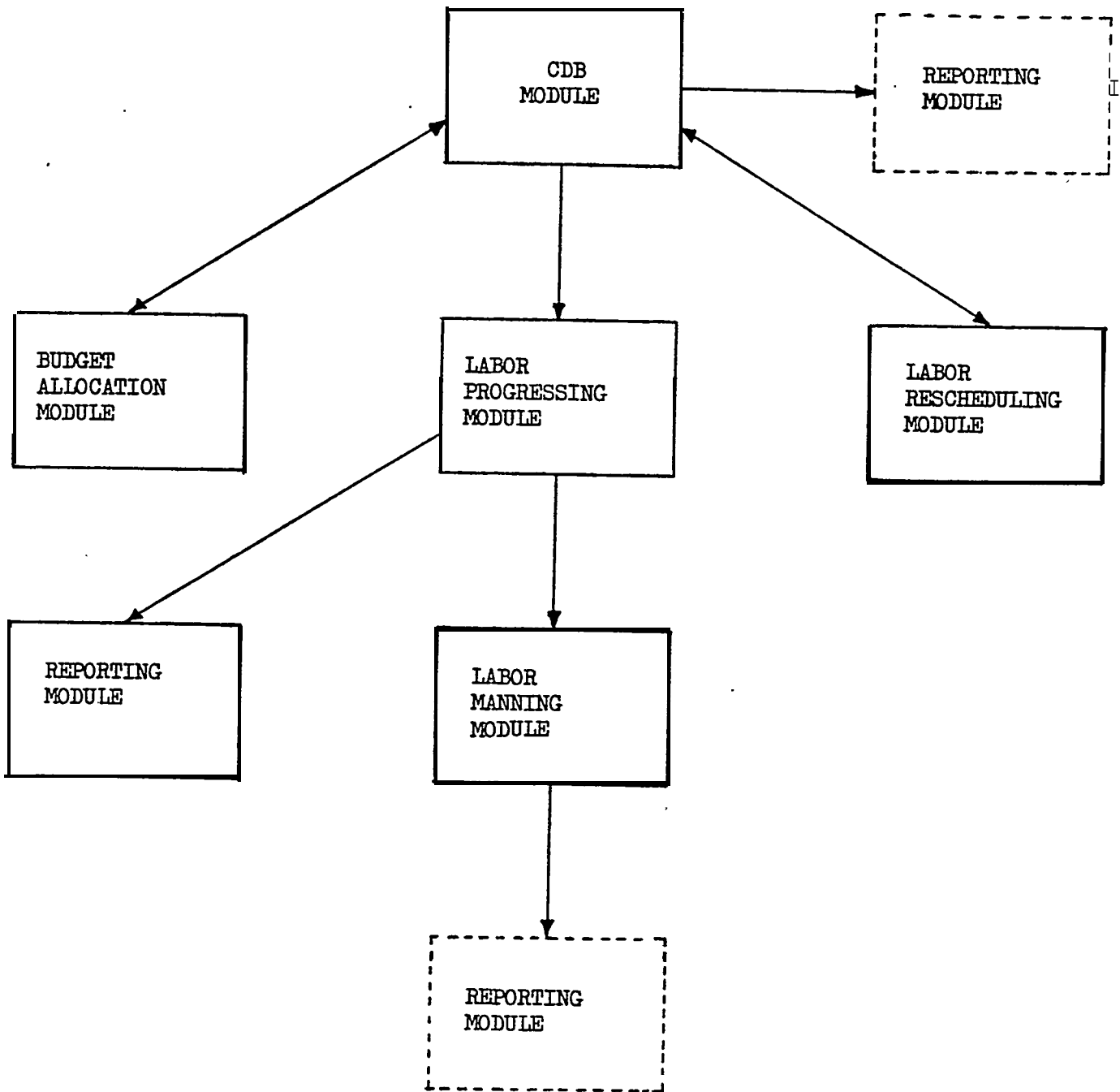
- a. The Planning and Scheduling module reports progress to schedule for work authorizations and statistics reflecting current schedule trends and problem areas.
- b. The Contract Performance module provides schedule and budget variance reports as required by DOD 7000.2 Specifications.
- c. The Budget Performance module reports progress to budgets for work authorizations reflecting budget overruns and underruns.
- d. The Real Time module provides on-line retrieval of scheduling, budgeting, and actual data from the CDB Module via terminals.

C. MODULE INTERFACES

A diagram of the Module Interfaces is provided to reflect the module interactivity within Ingalls' Production Planning and Control System.

I. SYSTEM OVERVIEW

C. MODULE INTERFACES



II. CONSOLIDATED DATA BASE MODULE

A. FUNCTION

The Consolidated Data Base (CDB) is a SYSTEM 2000 Data Base containing all work authorizations that must be performed by the crafts to construct each hull and is the nucleus for Ingalls' Production Planning and Control System.

With the Ingalls concept of constructing ships on an assembly line basis, each work authorization is identified to the work station in which the work is to be performed.

Each work authorization on the CDB contains schedule dates to provide time frames in which work is to be accomplished and also contains manhour budgets that will be required to complete the work.

The CDB provides for validation and accumulation of actual hours expended against each work authorization.

B. DESCRIPTION

The Consolidated Data Base is updated semi-weekly with input from Planning and Scheduling, Industrial Engineering and Finance.

Planning and Scheduling Department establishes and maintains all work authorizations on the CDB, identifying each to the work station in which work is to be done and maintains appropriate schedule data for each work authorization on the CDB.

Industrial Engineering Department determines Which cost centers will be involved in supporting each work authorization, identifies each operation to be performed by each cost center and develops the manhour budget that should be expended to complete each operation. Industrial Engineering is responsible for establishing and maintaining all budget data on the CDB.

Finance provides data to the CDB for those tasks that are not directly *related* to the construction of a hull, but must be accomplished to support the construction work authorizations developed by Planning and Scheduling and Industrial Engineering.

File maintenance reports from the CDB update processes are provided to the user departments to assist in maintenance of the data for which they are responsible.

On a weekly basis, all actual hours expended by the crafts against each work authorization are validated against the CDB to insure proper labor charging to current scope of work and all valid actual hours are then booked to the CDB for tracking, progressing and budget variance reporting.

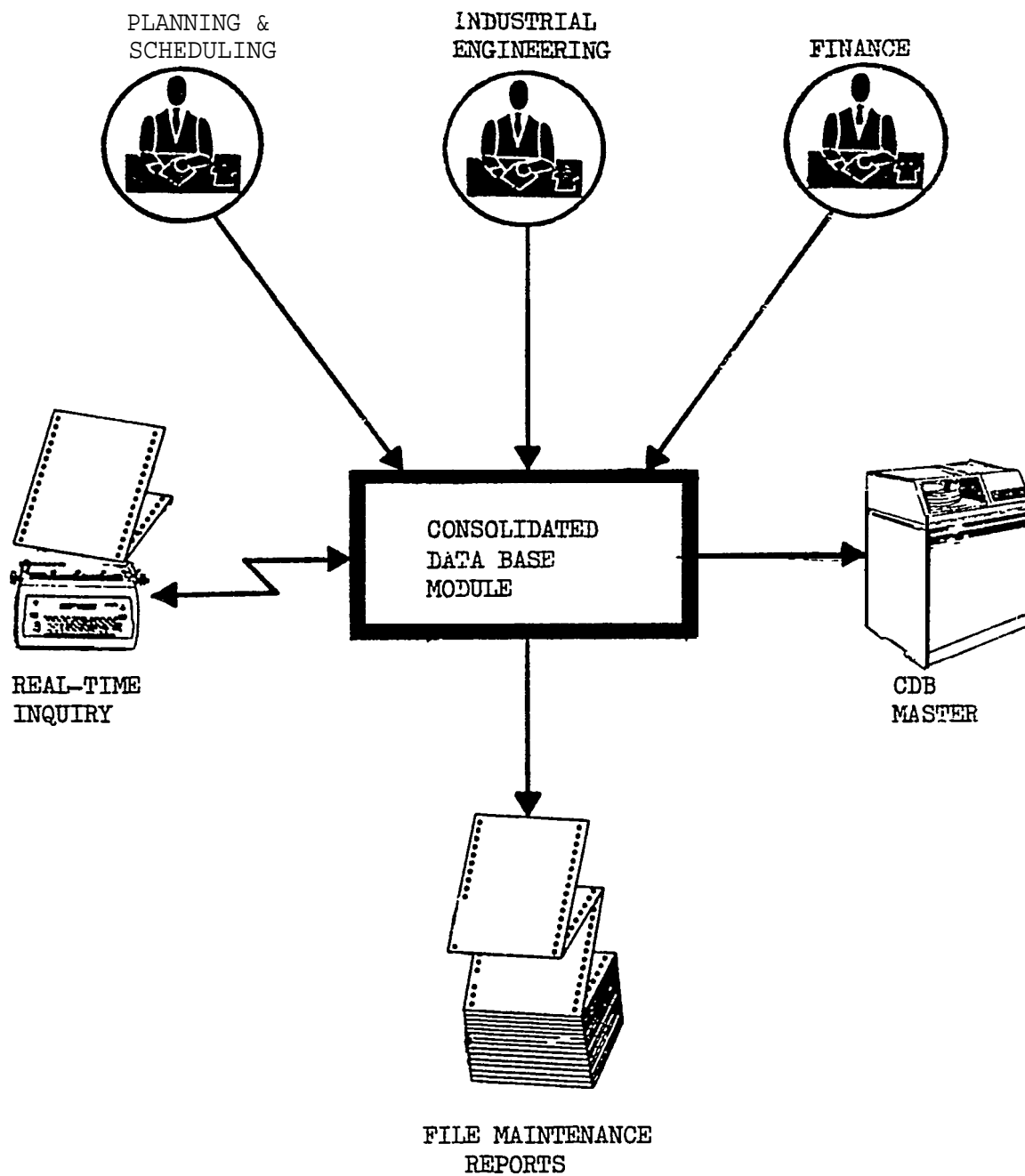
The real time inquiry capability of SYSTEM 2000 provides the user organizations immediate access to all data elements on the CDB to aid in the maintenance of this file. Inquiries also provide Craft Supervisors with immediate access to those work authorizations comprising the current scope of work so that each Supervisor can better plan and deploy available mainpower to accomplish assigned tasks.

D. INTERFACES

As the nucleus of Ingalls' Production Planning and Control System, the Consolidated Data Base provides all data that is required for the Budget Allocation, Labor Progressing, Labor Reporting and Labor Rescheduling modules described in this presentation.

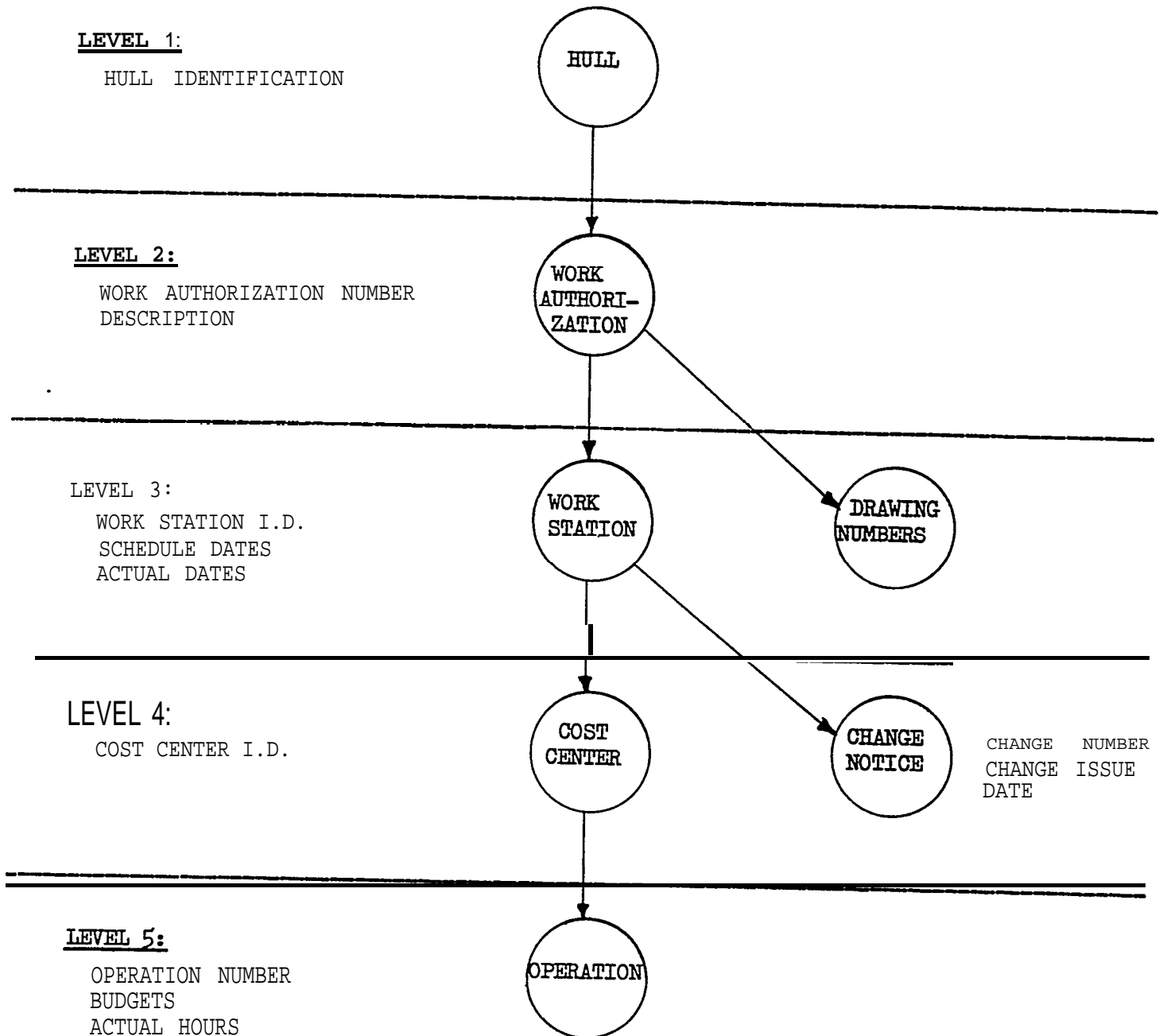
II. CONSOLIDATED DATA BASE MODULE

B. DESCRIPTION



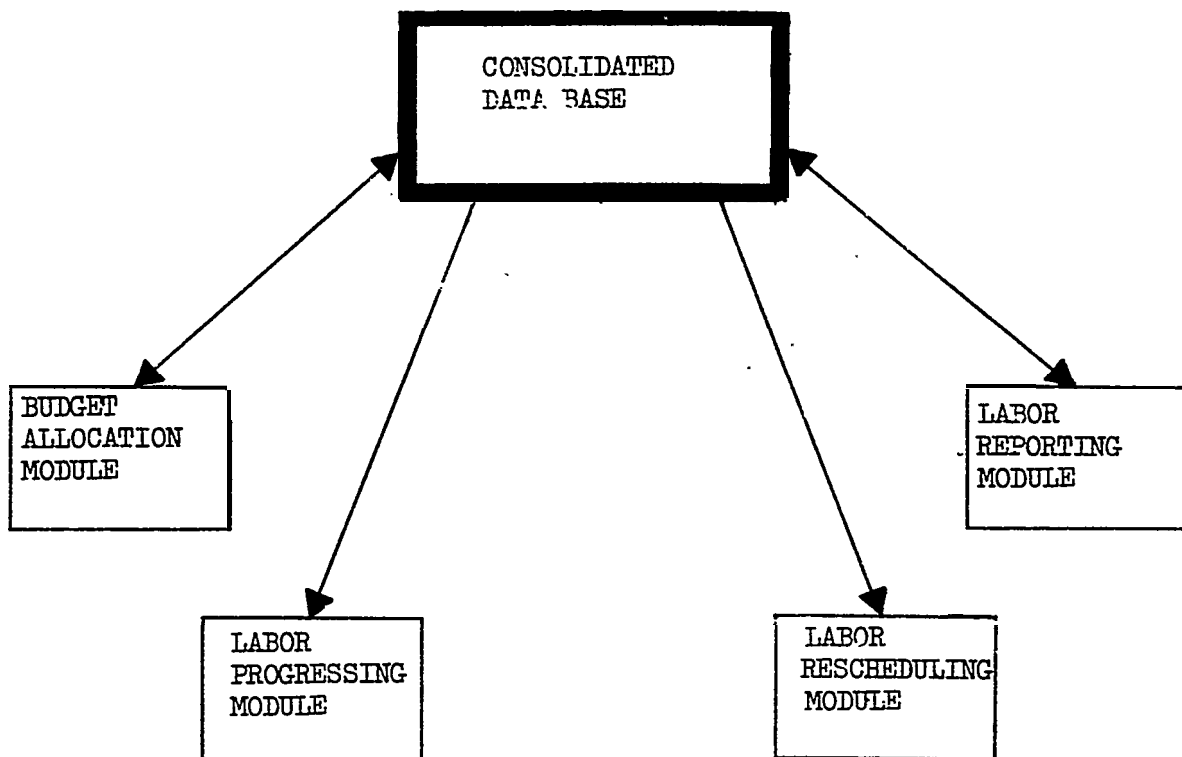
II. CONSOLIDATED DATA BASE MODULE

c. DATA BASE STRUCTURE



II. CONSOLIDATED DATA BASE MODULE

I. INTERFACES



III. BUDGET ALLOCCATION MODULE

A. FUNCTION

The Budget Allocation Module has two functions: (1) to allocate a Contract Budget to each work authorization based on the work authorizations Standard Budget, and (2) to allocate a Company Operating Budget to each work authorization based on the work authorization's labor charges and Standard Budget.

B. DESCRIPTION

The allocation of the Contract Budget is to be performed at the beginning of a contract and reallocated only upon concurrence by the Navy. At the start of a contract, the Industrial Engineering Department inputs the Contract Budget, authorized for each cost center to construct each hull, to the Budget Allocation Module. The Budget Allocation Module then sums from the CDB Module by hull by cost center the Standard Budgets established for all work authorizations within the hull and cost center. A factor is obtained by dividing the hull, cost center Contract Budget by the hull, cost center Standard Budget. This factor is then multiplied by the Standard Budget for each work authorization for the hull, cost center yielding the work authorizations Contract Budget. Transactions with each work authorizations Contract Budget are generated by the Budget Allocation Module for updating the CDB by the CDB Module.

The allocation of the Company's Operating Budget is performed at the beginning of each fiscal year and again at mid-fiscal year. To begin an allocation process, the Industrial Engineering

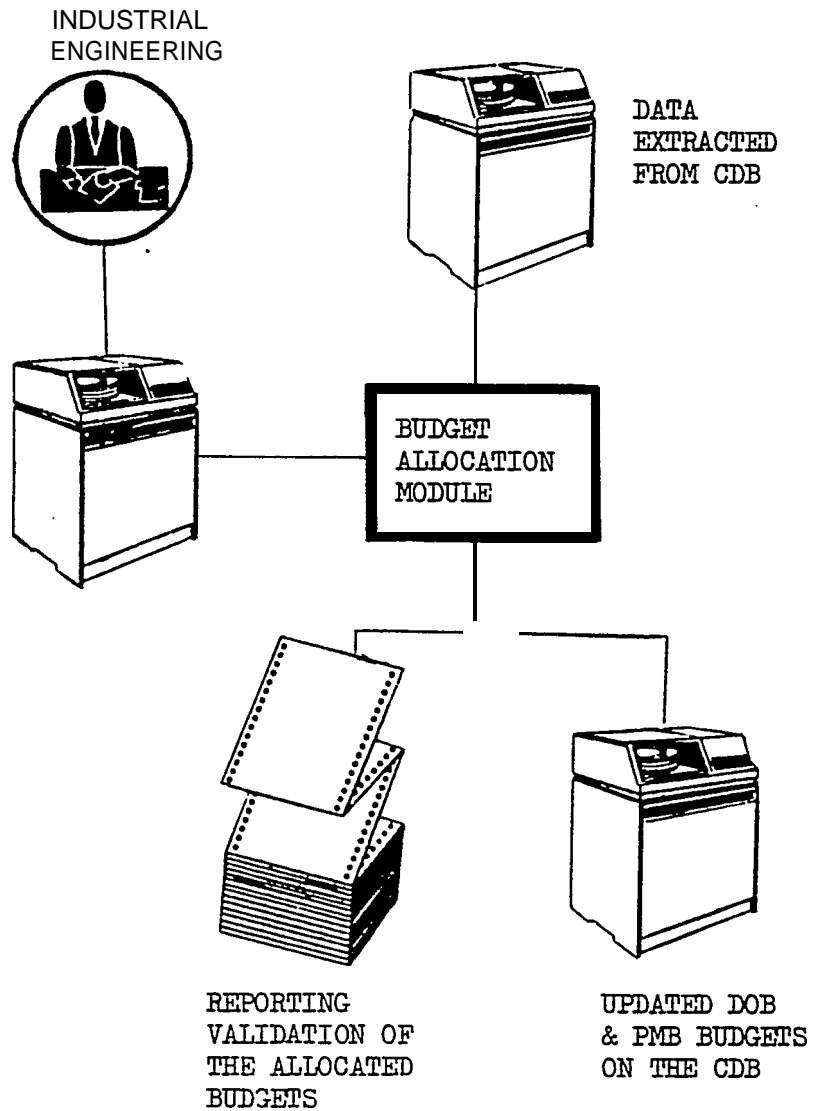
Department inputs the Company's Operating Budget, authorized for each cost center to construct each hull, to the Budget Allocation Module. The Budget Allocation Module then distributes the budget, to each work authorization for the hull, cost center, based on the status of the work authorization. A two step process is required to accomplish the allocation: first, each completed and in-process work authorization is given an amount of budget equal to the labor charges incurred by the work authorization; second, the Operating Budget not allocated in the first step is allocated to the in-process and not-started work authorizations by the ratio of the work authorizations "to-complete" standard to the hull, cost centers "to-complete" standard times the Operating Budget not allocated in the first step. Exception reports are generated if an excess or deficient Operating Budget is input to the Budget Allocation Module by the Industrial Engineering Department. To complete the process, the Budget Allocation Module generates transactions with each work authorizations Operating Budget for updating the CDB by the CDB Module.

C. INTERFACES

The Budget Allocation Module extracts work authorizations with their Standard Budgets from the CDB Module; allocates a Contract Budget or Company Operating Budget to each work authorization; and generates transactions with each work authorization's allocated budget back to the CDB Module for updating the CDB.

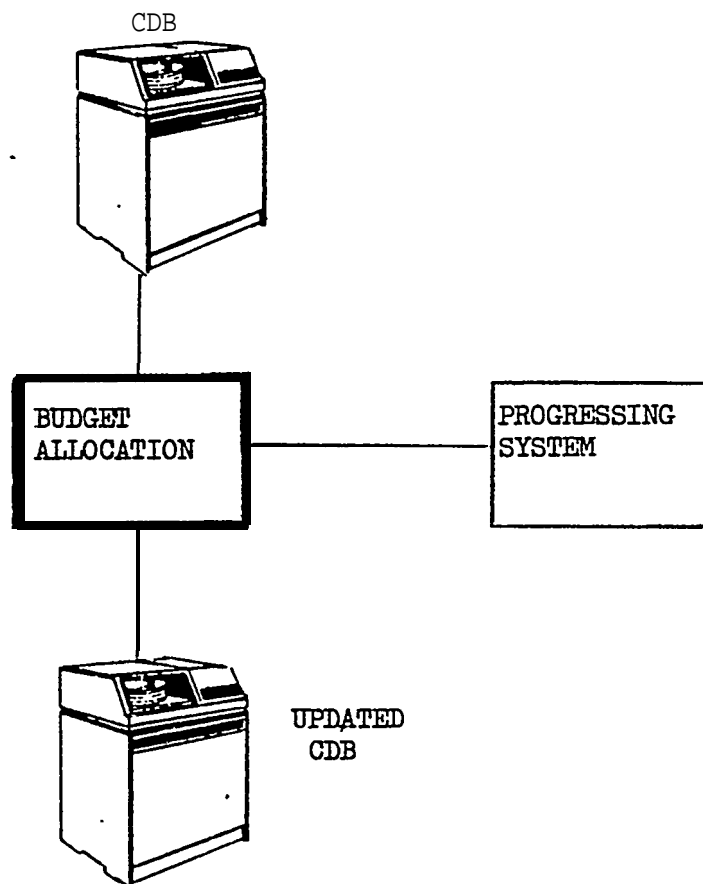
III. BUDGET ALLOCATION MODULE

B. DESCRIPTION



III . BUDGET ALLOCATION MODULE

C. INTERFACES



IV. LABOR PROGRESSING MODULE

A. FUNCTION

The Labor Progressing Module computes budget progress for work authorizations directly associated with a hull's construction and then uses this progress to compute the supervision and support work progress associated with the direct construction progress. This module then generates various reports, reflecting budget progress and performance, to be used by shipyard management. This module has the capability of reflecting progress/performance to either the Contract Budget or the Company Operating Budget or the Standard Budget.

B. DESCRIPTION

At mid-month each month, a report of all in-process work authorizations and those scheduled to start within thirty days is generated from the CDB by the reporting module. This report is distributed to the crafts performing the work; they record their percent complete for each work authorization; and at month end, the percent completes are input to the CDB Module to be recorded on the CDB. During the first week after month end, the Progressing Module extracts all work authorizations from the CDB and computes progress in a two step process. First, for each work authorization associated with a hulls construction, the module multiplies the percent complete, established by the craft, times the budget yielding earned budget; a completed work authorization is one hundred percent complete. The earned budget and total budget for each direct construction

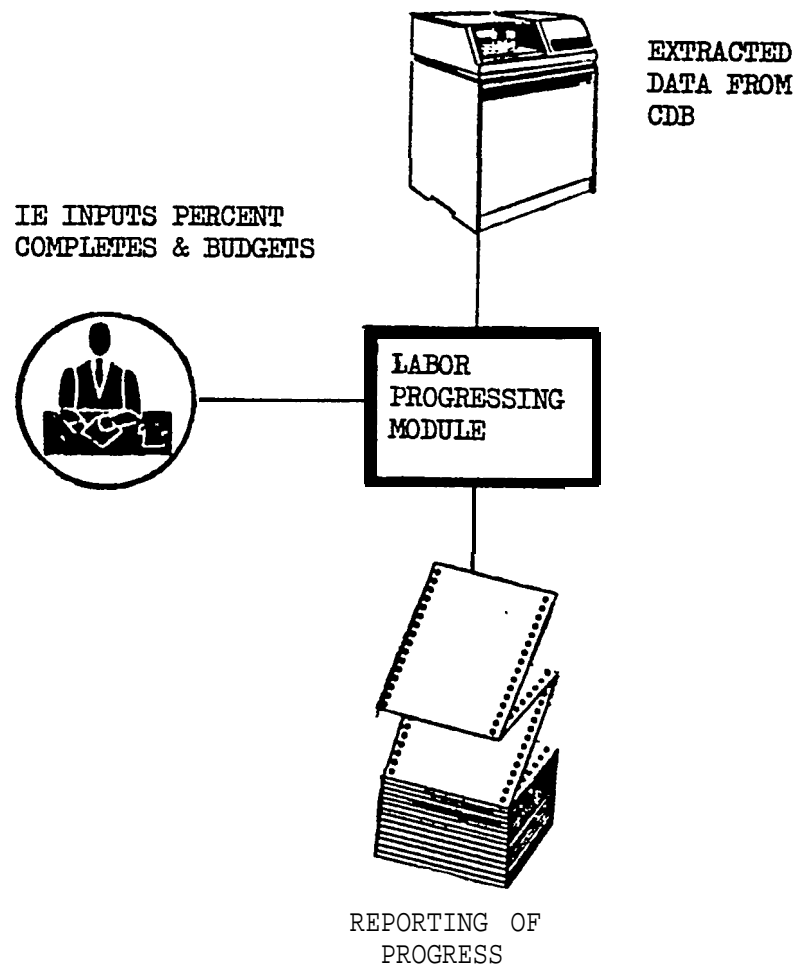
work authorization is summed to three different levels and a percent complete is computed at each level. These percent completes will be used in the next step of the process. In the second step, all supervision and support work authorizations are progressed. Each of these work authorizations is progressed by a pre-determined curve that directly correlates to one of the three levels of percent complete computed for direct construction work authorizations. After all work authorizations have been progressed, reports are generated that reflect progress, performance, and budget overrun/underrun conditions.

C. INTERFACES

The Labor Progressing Module extracts the work authorizations from the CDB Module and computes progress for them. Each progressed work authorization is sent to the Labor Manning Module which computes and time-phases the "to-complete" budget; these same work authorizations are also sent to the Reporting Module where budget performance reports are generated. The Labor Progressing Module computes the percent complete at hull, account, cost center, operation and transmits it to the Reporting Module to be used in contract reporting of budget and cost variances.

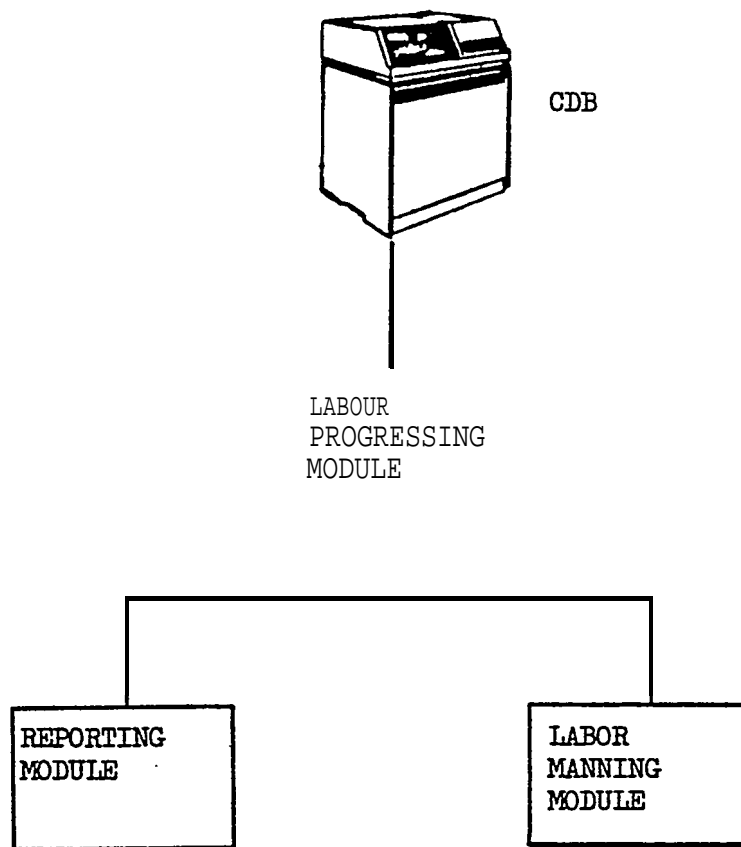
IV. LABOR PROGRESSING MODULE

B. DESCRDTION



IV. LABOUR PROGRESSING MODULE

C. INTERFACES



V. LABOR MANNING MODULE

A. FUNCTION

The function of the Labor Manning Module is to integrate work authorization budgets and schedule dates to Produce a budget manhour spread.

The module is designed to provide management various reports depicting manloading requirements for the cost centers in order to assist management in acquiring the personnel necessary to support ship construction/overhaul.

B. DESCRIPTION

The module time-phases, by hull and cost center, the work authorizations budget among the valid workdays per accounting month as specified by the scheduled start date and the scheduled completion date.

The time-phasing techniques provided by the module are as follows:

1. Linear- all valid workdays which fall within the start date and completion date, inclusively, shall receive an equal pro-rata share of the work authorization's budget .
2. Predetermined Curves - The Manpower Planning Department inputs manloading curves based on historical data. The module time-phases either a cost center to the shape of a curve or construction type work authorizations to the shape of a curve.

3. Proration - The module develops a manloading curve by time-phasing construction work authorizations and then prorates supervision in direct relation to the shape of the curve developed by time-phasing construction work.

The module also has the capability to reschedule delinquent work and recalculates the estimate to complete (ETC) or the estimate at complete (EAC) for not started and in process work authorizations if the user inputs a date specifying the point from which the spread of work authorizations will be started.

C. INTERFACES

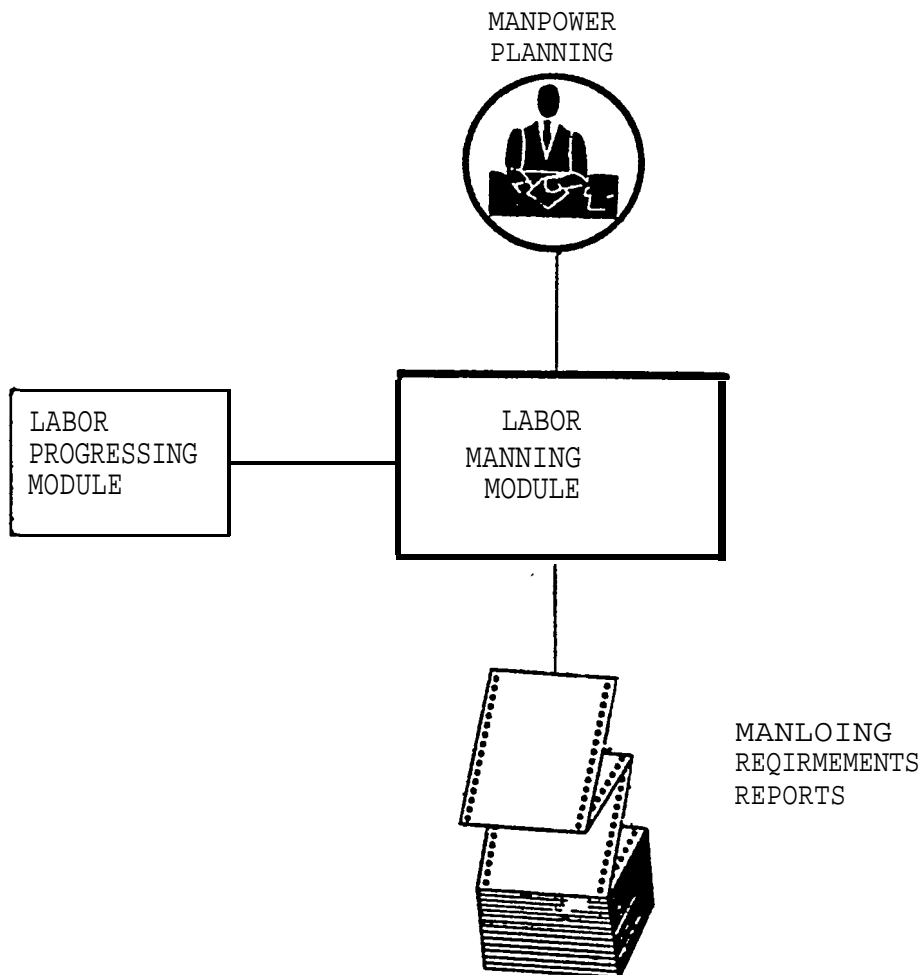
The time-phased manhours developed in the Labor Manning Module are passed to the Contract Performance Reporting Module and the Material EAC Module.

The Contract Performance Reporting Module uses the time-phased manhours to report the budgeted cost to work scheduled (BCWS).

The Material EAC Module uses the time-phased manhours to time-phase stock and raw material in direct relation to the projected manloading that uses these types of materials.

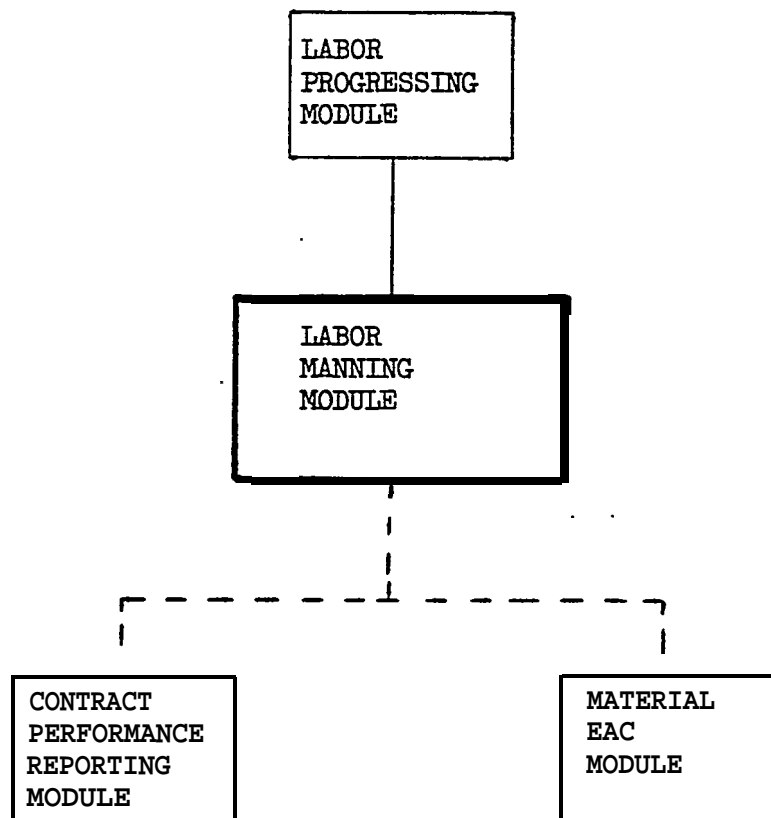
V. LABOR MANNING MODULE

B. DESCRIPTION



V. LABOR MANNING MODULE

C. INTERFACES



VI . LABOR RESCHEDULING MODULE

A. FUNCTION

The Labor Rescheduling Module consists of a PERT network for the construction of each hull. All work authorizations for a hull on the CDB are cross-referenced to a PERT network activity in the Labor Rescheduling Module. It is the function of the Labor Rescheduling Module to reschedule work authorizations whenever the schedules of the PERT network activities have changed. These new work authorization schedules are then transmitted to the CDB update program to change the work authorization schedules on the CDB.

B. DESCRIPTION

The Planning and Scheduling Department develops PERT networks of the major activities necessary to support construction of a ship. These network activities are then input to the Labor Rescheduling Module. This module insures that the activity schedules are in the proper sequence and that there is no unused time between the completion of one activity and the start of the next; exception reports are generated reflecting any discrepancies. Planning and Scheduling re-inputs corrections to the network activities until all exceptions have been cleared. Once accurate networks are established, then work authorizations from the CDB Module are brought into the Labor Rescheduling Module and linked to the applicable network activity by a cross-reference number. The schedules for each of the work authorizations are then changed to fit within the network activity schedule.

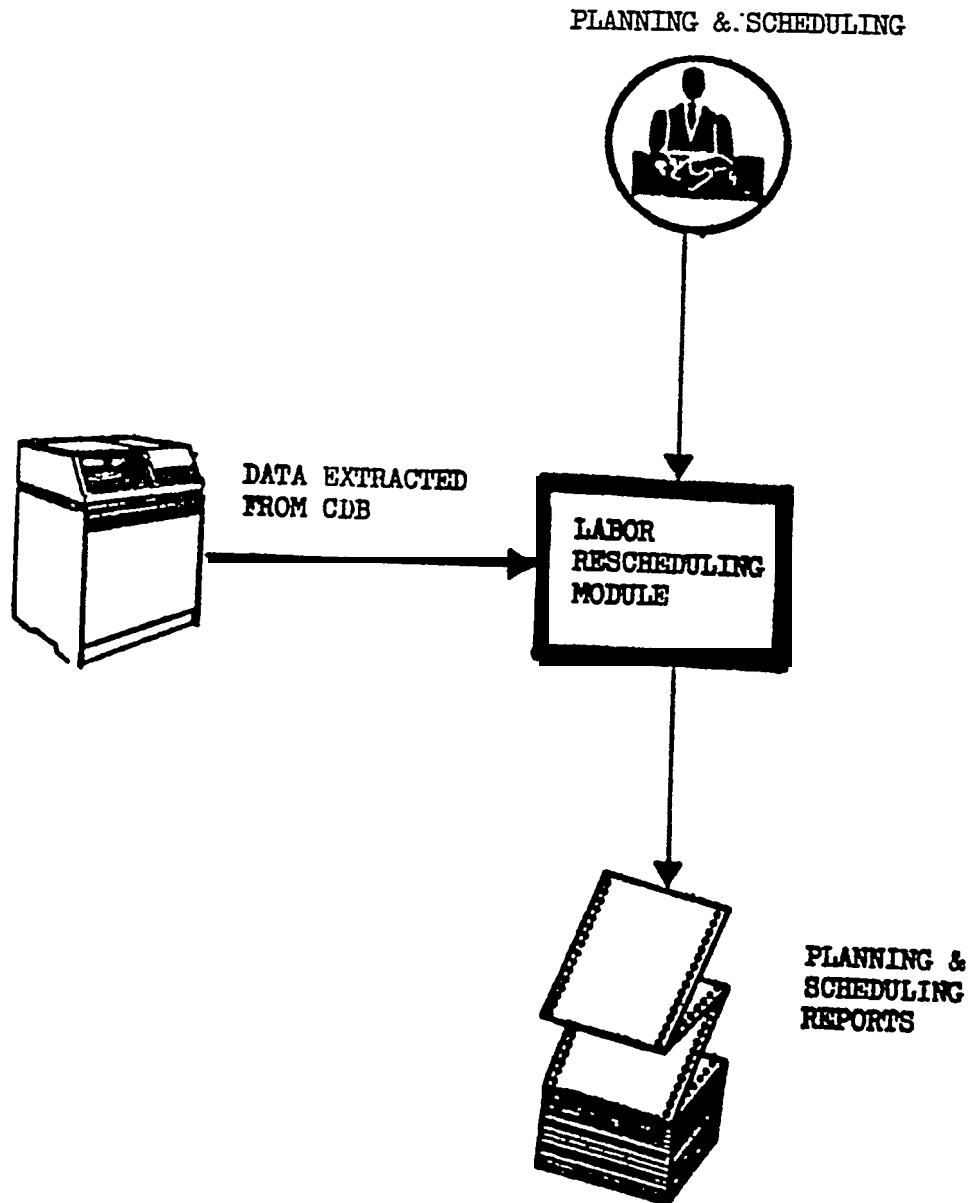
The revised work authorization schedules are then transmitted to the CDB Module for modification of the work authorization schedules on the CDB.

c. INTERFACES

The Labor Rescheduling Module extracts work authorizations with their schedules from the CDB Module, reschedules the work authorizations, and transmits the new schedules for the work authorizations back to the CDB Module.

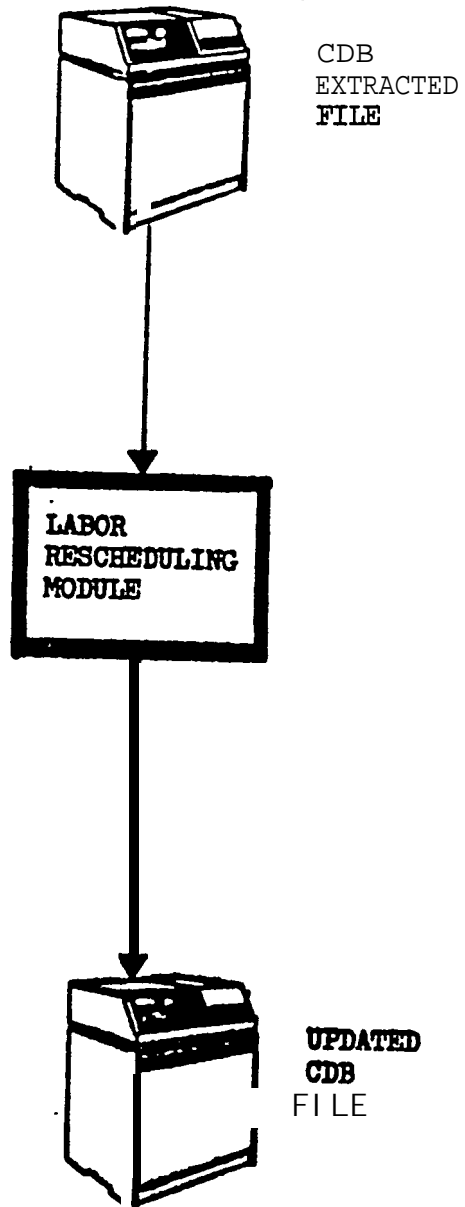
VI. LABOR RESCHEDULING MODULE

B. DESCRIPTION



VI. LABOR RESCHEDULING MODULE

C. INTERFACES:



VII . LABOR REPORTING MODULE

There are more than 365, 000 work authorizations and associated data for approximately 40 hulls, which are in various stages of construction, stored on the CDB. This large volume of information required to support ship construction prohibits manual tracking, progressing, and statistical analysis. The many segments of data are compiled into various reports specifically designed to meet the needs of Production Control, Planning & Scheduling, Financial Accounting, Industrial Engineering, and the various levels of Ingalls Shipbuilding management.

A. PRODUCTION PLANNING AND CONTROL

Production Planning and Control reports contain production schedule information which is normally displayed by Hull. The nucleus of this reporting module is the schedule analysis segment which provides information relative to the interaction of schedules within one or more hulls. Another important segment of this module is the ability to report between crafts interfacing responsibilities. There are approximately 50 reports available in this module of which any or all of them can be selectively produced on a weekly basis.

B. CONTRACT PERFORMANCE

The Contract Performance reporting module provides both Ingalls management and the Navy current status and the long range plan for fulfillment of contractual requirements. The central source of data is generated via the Labor Manning Module and includes Company Operating Budget and Contract Budget data time phased.

The Contract Budget is used to status and report progress to the Navy while the Company Operating Budget is used by Ingalls management to status the detail work to be accomplished throughout the duration of the contract. This reporting module produces approximately 54 separate reports which provide Ingalls management and the Navy the current contract status and the Estimate to Complete contract status.

C. BUDGET PERFORMANCE

The Budget Performance reporting module provides work authorization progress and performance information for Ingalls management; primarily, Industrial Engineering, Quality Assurance, and Operations. Data for this module is generated via the Labor Progressing module and includes Company Operating Budgets, Contract Budgets, and Labor Actuals. Approximately 20 reports are available via the Budget Performance reporting module and are used in evaluating actual progress and performance vs. previously established budgets. Many report sequences and selections are available, thus providing a very versatile reporting system.

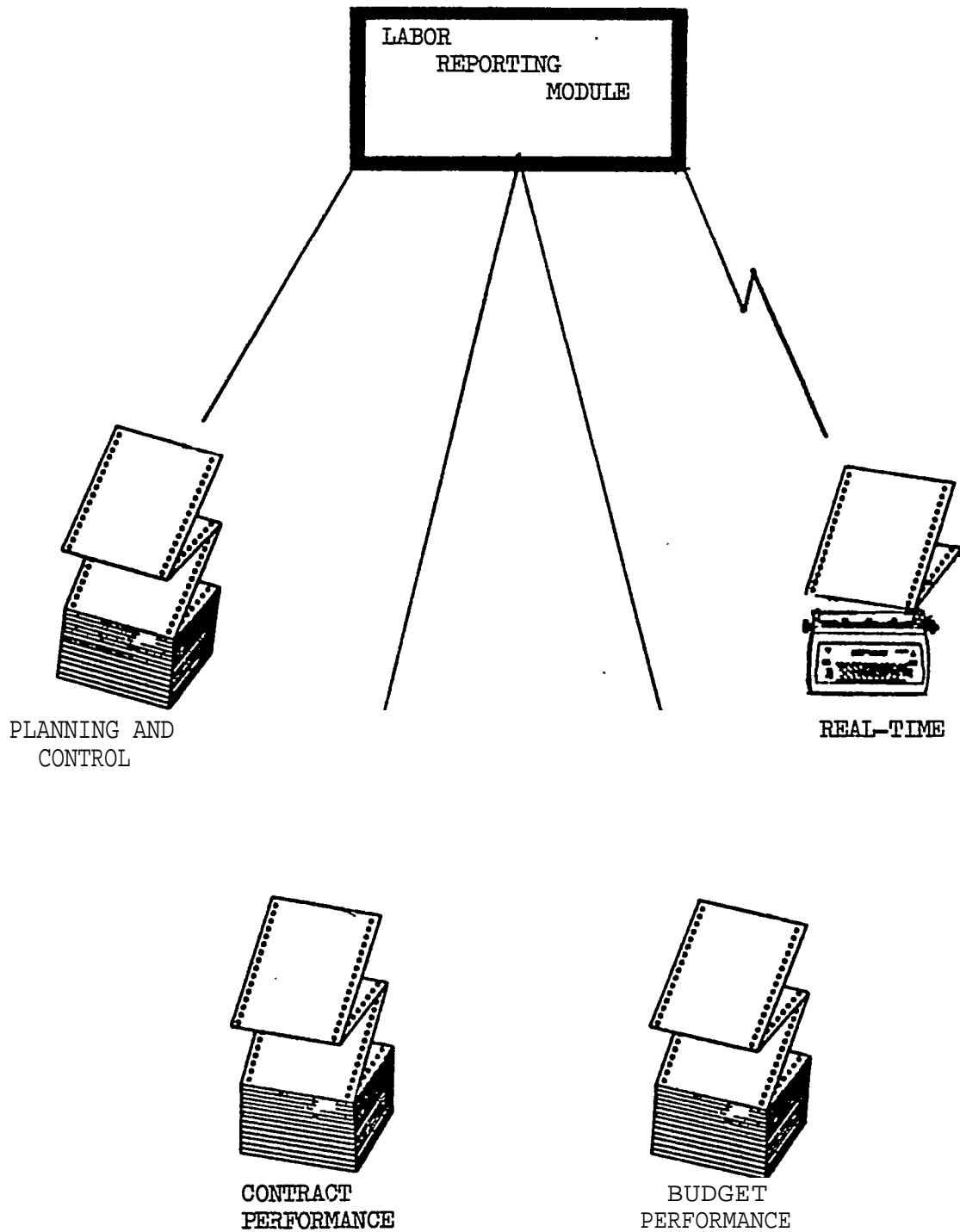
D. REAL TIME

The automated method of building ships at Ingalls requires accurate and timely dissemination of work authorization data to the crafts. A Real Time module is employed which allows immediate access to the Consolidated Data Base for work authorization information. Approximately 60 communication terminals are strategically located throughout the shipyard to support this activity. Training and utilization of these terminals is simplified through an easily accessible on-line

user's guide. More than sixty different retrievals provide the users rapid access to work authorization schedules, budgets and other pertinent information. Future enhancements include a module which will peemit indirect updating via the data terminals.

This Real Time module is a vital part of the total Ingalls' Production Planning and Control System and complements the various reporting modules previously described in this presentation.

VII . LABOR REPORTING MODULE



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